

**PALMDALE BOUND** — A bridge crane at Rockwell International's Tulsa Division plant lifts the first of four 30-foot sections of the payload bay doors which last week were shipped to RI's Palmdale, California Orbiter assembly plant. The doors are the final major components to be delivered for Orbiter 101, and are the largest aerospace parts yet to be built of advanced epoxy-graphite composite materials. Design to delivery took 15½ months.

## JSC, MSFC to Manage Space Station Studies

Grumman Aerospace Corporation, Bethpage, New York, and McDonnell Douglas Astronautics Co., Huntington Beach, California, were selected today for negotiation of fixed price contracts to conduct parallel space station systems analysis studies for NASA.

Each 18-month study will cost approximately \$700,000. JSC will manage the McDonnell Douglas study. The Grumman study will be managed by the NASA Marshall Space Flight Center, Huntsville, Alabama. The work is to begin April 1.

The contractors are to define and analyze concepts of space station facilities for low and synchronous altitude Earth orbit including orbit-to-orbit transportation. Emphasis is to be placed on assuring a space station of modular construction with growth potential over a number of years.

The space station would be designed to serve as an operational

base in space and also a space laboratory.

As an operational base the space station could serve as a test and construction facility to support the manufacturing, fabrication, and assembly of large space structures which may be required for a variety of earth benefits from space. Other uses as an operational base may include retrieval and repair of spacecraft and serving as an orbital propellant depot to refuel transfer systems carrying payloads from low to high Earth orbit or to an escape orbit.

Serving as a space laboratory, the space station could accommodate materials processing, research and development leading to commercial manufacturing, basic and applied physical sciences experiments, space physics and astronomy missions, life sciences research and for continued development of sensor technology in areas such as Earth surveys, navigation, weather and climate research.

Proposals on the studies were also received from the Rockwell International Space Division, Downey, California, and Boeing Aerospace Company, Seattle, Washington.

## Germans Visit JSC to Survey Vestibular Work

A vestibular research team from the German Federal Republic Research and Development Facility for Aviation and Spaceflight (DFVLR) will visit JSC March 24 and 25. The group will also visit the US Naval School of Aviation Medicine at Pensacola, Florida and the NASA Ames Research Center, Mountain View, California.

The team is surveying vestibular function investigations that have been conducted in the US manned space flight program as part of DFVLR's preparations of a vestibular experiment to be flown aboard the Space Shuttle-borne Spacelab.

Members of the German team are Prof. Rudolf von Baumgarten of the University of Mainz, Dr. Thomas Brandt of the University of Freiburg, Peter Griebel of Toennies Erben KG, Dr. Peter Junk, Erno-Bremen, Dr. Hans Scherer, University of Munich, Dr. Johannes Dickgans of the University of Freiburg, Dr. Klaus Otto Pfeiffer of DFVLR, and Prof. Otto Harth of the University of Mainz.

At JSC, the group will consult with Dr. J. L. Homick of Biomedical Research Division and others of the JSC Life Sciences Directorate.

## Stop Signs Switched at Saturn-Gemini

Stop signs at the intersection of Saturn Lane and Gemini Avenue near the JSC Credit Union this week were switched from Saturn Lane traffic to Gemini Avenue only.

The change was approved February 19 by the Harris County Commissioners after Commissioner Tom Bass recommended the change.

Until the new wears off the change, JSC drivers are urged not to take their right-of-way for granted while crossing Gemini Avenue — there is always that 10 percent that doesn't get the word, or for some reason fails to see that big red stop sign.

## JSC Extends Draper Contract

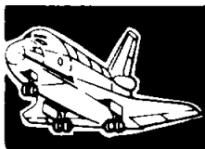
JSC has awarded a \$6.8 million, two-year contract extension to the Charles Stark Draper Laboratories of Cambridge, Massachusetts, for the technical support of Space Shuttle Orbiter avionics software development.

Under the terms of the contract, the Draper Laboratories will provide the computer programming relative to the integration of the guidance, navigation, and control systems of the Space Shuttle Orbiter, the reusable space system scheduled to be launched in early 1979. This effort, which will employ approximately 55 people at the Draper facilities in Cambridge, Mass., shall include software design, design verification, simulation, requirements formulation, and analysis for the Orbiter avionics as required for the guidance, navigation and control computer programming.

# ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS



VOL. 15 NO. 5

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MR. GEMINI---

## Chuck Mathews Retires

Charles W. Mathews, NASA's Associate Administrator for Applications, and former Gemini Program Manager at JSC has announced his retirement effective Feb. 27, 1976, after 33 years of government service with NASA and its parent organization, NACA. He will continue to serve in his present capacity at least through March in order to assure a smooth transition of the management of the Office of Applications.

NASA Administrator James C. Fletcher said, "NASA recognizes the tremendous contributions made by Charles Mathews leading to our nation's preeminence in space. Perhaps more importantly Mr. Mathews has provided strong leadership in applying what has been learned in space to practical uses here on Earth."

Mathews' career with NACA began in 1943 when he joined the science staff at the Langley Research Center, Hampton, Va. Prior to the formation of NASA, he served as chairman for the group which developed the detailed specifications for the Mercury spacecraft.

Mathews transferred to JSC's ancestor, the Space Task Group at Langley when Project Mercury became an official national program in 1958. In later years at JSC, he served as manager of the Gemini Program.

Following completion of the

Gemini Program, Mathews was appointed director of the Skylab Program (then the Apollo Applications Program) at NASA Headquarters. In May 1968, he assumed the position of Deputy Associate Administrator for Manned Space Flight and served in that capacity until he was appointed to his current position when the Office of Applications was established Dec. 3, 1971.

Mathews was awarded the NASA distinguished Service Medal by President Lyndon B. Johnson Nov. 23, 1966, for his contributions to the

(Continued on page 2)

### in this ROUNDUP...

...is a photo of American Indians at JSC who have formed a club called "New Trails" and a story about how NASA scientists at National Space Technology Laboratories have found a way to put the pesky water hyacinth to work — page 2.

On page 3, in addition to the Swap Shop and EAA Activities, are photos from the EAA Western Dance and a by-lined saga of the JSC Golf Association El Dorado tourney. A story and pictures on page 4 describe the Tech House that may become the residence of the future.



**QUIET ON THE SET, PLEASE!** — An American International Pictures camera crew films a scene in the JSC Space Environment Simulation Laboratory for AIP's feature-length movie, *Futureworld*. Starring Peter Fonda, Arthur Hill (inset) and Blythe Danner, the film is a sequel to *Westworld*. JSC shooting will continue until March 30.



**FOLLOW NEW TRAILS**—Members of the newly-formed New Trails Club meet to plan activities for the club, aimed toward fostering understanding of native American cultures. Open to all JSC employees, the EAA-sanctioned group will study tribal lore, culinary habits and cultural achievements—past and present—of native Americans. The group will also host three native American engineering students from the University of Oklahoma who will be on aerospace fellowships at JSC this summer. (See photo and caption on the next page.) Seated, left to right, are Lee Linson, Gordon House/Oneida, Jerry Elliott/Osage, Joe Doak/Cherokee, and Jack May/Cherokee. Standing: Loretta Burgess/Seminole, Fran Bergeson/Cherokee, Wauhilau "Mike" McKenzie/Cherokee, and Glenda Warren/Cherokee. Not in photo: Bill Sheegog, Cecil Gibson/Cherokee, Glen Brace, Margaret Tatum/Cherokee, Phoncille DeVore, and Jim Brady/Creek.

## NASA Lab Enlists Water Hyacinths For Water Clean-Up, Possible Fuel

Water hyacinths are "bustin" out all over the vicinity of a NASA laboratory and show real promise of providing the raw material for many useful products. That is the opinion of the NASA scientists who have spent the past year in experimentation centered on the aquatic plants as a filtration system for purification of polluted waters, as the source of bio-gas for fuel, as a protein and mineral additive to cattle feed, and as a soil fertilizer and conditioner.

The investigative program is carried out at NASA's National Space Technology Laboratories, Bay St. Louis, Miss., under the direction of biochemist Bill Wolverton, who states in a preliminary report that results substantiate theoretical data, and

that "an expanded research effort might be the start of a permanent solution to present problems such as natural gas shortages, pollution control and control of excessive plant growth in certain waters, in addition to producing large quantities of fertilizer from the methane gas production process."

Some Florida streams have been virtually choked off by water hyacinths.

He adds, in a cautionary note, that the economics of harvesting are not fully resolved and that a balanced system for total use of the plant must be more fully explored.

The most ambitious experiment to date in the water hyacinth project involves the city of Bay St. Louis. Last spring, NASA researchers—at the request

of city officials—fenced in three acres of a 40-acre lagoon that receives raw sewage from 6,000 households, and planted them with water hyacinths. Earlier laboratory experiments had revealed that the vascular plants (those equipped with a system of vessels that conveys nourishment from roots through leaves) were able to absorb and metabolize astonishing quantities of nutrients and pollutants from domestic sewage waste waters.

The plants, which are particularly fruitful in sewage-laden waters, immediately underwent a prodigious growth in the Bay St. Louis lagoon, soon producing eight to sixteen tons of plants (weight after harvesting) per acre per day. (Growth rate varies depending upon quantities of sewage present in the water.) As the experiment progressed, however, it became apparent that even such a phenomenal growth rate was not sufficient to purify the 40-acre lagoon if the plants remained confined to the allotted three acres.

Accordingly, the planted area was enlarged to about seven acres. By summer's end, conditions had improved dramatically. A large part of the heavily polluted, noxious lagoon literally had been transformed into a flower garden. Next summer, some 12 acres will be set aside for additional tests, an amount estimated as more than enough to purify the entire lagoon outflow.

Similar research was conducted in the small Mississippi community of Orange Grove in the summer of 1975, with results much like those in Bay St. Louis, though on a smaller scale. Seven-tenths of an acre of the Orange Grove sewage lagoon was planted with water hyacinths to purify up to half a million gallons of sewage outflow produced daily.

## Ames Team Investigates Photosynthesis System

A team of scientists at the University of California, San Francisco, and NASA's Ames Research Center, Mountain View, Calif., is working on a recently-discovered bacterial system for converting sunlight into chemical energy and food.

The work is based on the discovery (by Dr. Walter Stoeckenius, Univ. of Calif., San Francisco) of a photochemical mechanism other than chlorophyll-based photosynthesis in a living organism, a finding which has important implications for the understanding of basic life processes.

The work has been done in connection with a NASA-sponsored program of studies of Earth organisms which live in extreme environments—such as those which might be expected on other planets. The studies provide clues to the nature of life in such environments.

Photosynthesis is the process operating in green plants in which carbohydrates are formed under the influence of sunlight, with chlorophyll serving as a catalyst. It is the ultimate energy source for plant and animal life on Earth, and is the basis of agriculture. It is also the most efficient large-scale method known for utilizing energy from the Sun

The new photosynthetic process is based on a purple pigment instead of a green one, and is much simpler. The purple pigment is a protein molecule, called bacteriorhodopsin, which is chemically similar to the visual-purple pigment in the eye. The molecule was discovered in the cell membrane of the bacterium, *Halobacterium halobium*, which lives in near-saturated salt solutions.

As a result of the work, several new insights into basic life processes have already been derived. They include:

- The discovery that the single protein molecule, bacteriorhodopsin, functions as a light-driven pump for hydrogen ions (protons). Since protons are electrically charged, this pump converts solar energy into electrical energy.

- Discovery of a new way of providing the energy to make ATP, the energy-story molecule in all living cells.

- Mapping of the three-dimensional structure of this

complex protein molecule. This is one of the few protein molecules for which the three-dimensional structure is known and the only membrane protein for which it is known at high resolution.

- A better understanding of how nutrients from dilute solutions outside the cells are concentrated and transported into the cell interior, utilizing electrical and chemical gradients generated across the cell membrane.

- An improved understanding of function and structure of cellular membranes.

Dr. Stoeckenius found the purple pigment in bacteria while at Rockefeller University, New York, N.Y.

On moving to UCSF, Dr. Stoeckenius and his coworkers identified the pigment chemically and found that when illuminated it ejected protons to the surrounding liquid medium.

## MATHEWS

(Continued from page 1)

U.S. manned space flight program. He received the award a second time in 1969 for his contributions to the first manned lunar landing.



He was awarded the NASA Outstanding Leadership Medal in 1965 and is also the recipient of numerous awards from various technical societies. He is a fellow of both the American Astronautical Society and the American Institute of Aeronautics and Astronautics.

In announcing his retirement, Mathews reemphasized his strong belief in NASA, its programs and particularly the application of space capabilities to practical uses. He said: "In whatever endeavors I undertake in the future, I plan to continue to devote effort to the further realization of the tremendous potential of space to provide real world benefits to all people."

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## ROUNDUP



NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS

The Roundup is an official publication of the National Aeronautics and Space Administration Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for JSC employees.

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# EAA ATTRACTIONS

## TICKETS

On sale in Bldg 11 Exchange Store 10 am to 2 pm, no refunds: Windmill Dinner Theater, *Bottoms Up* - A Las Vegas review, March 16 - April 18, \$14/couple, only 20 tickets available. Dean Goss Dinner Theater, Neil Simon comedy *The Star Spangle Girl* March 9 - April 7, \$16/couple. SeaArama, \$3.25 adults, \$2.25 children. Free Disney Magic Kingdom Cards and Lion Country Safari Cards. EAA phone number is 4592.

Houston Astros gift coupons, box seats \$4, reserve seats \$3.15. Houston Aeros hockey gift coupons for last seven home games at a 20-percent EAA discount: \$6.75, \$5.95 and \$4.35 for home games March 19, 21, 26, 28, 30 and April 4, 6.

## GILRUTH RECREATION CENTER

Schedules of events are posted in the cafeterias in both building #3 and #11. Also, all EAA building reps receive a monthly schedule to allow them to answer your questions. For specific information, please call x3594.

## SPORTS

The recent basketball season ended with the following champions:

A League - Klate Holt, Captain - Morris Williams

B League - Brewers, Captain - Larry Davis

C League - Marx Brothers, Captain - Dave Eichblatt

Klate-Holt also won the post season Four Team Double Elimination Tournament to become the outright champions of the February/March season.

The womens volley ball season was completed on Monday, March 1st with the High Hopes, coached by Dave O'Brien, capturing first place honors.

## COMING ATTRACTIONS

Softball registration: March 8th - 26th, forms are available at the Recreation Center. Season starts April 12th. Total fee is \$65.00 per team. Teams may reserve fields for practice once they have registered for the April/May League.

Belly Dancing Lessons: Beginners & Intermediate - \$20.00/10 wks. Advanced Dance Clinic - \$25.00/10 wks. Registration begins March 15th with classes starting the week of March 29th.

Tennis Lessons: Beginners & Intermediate: Adults - \$30.00, Children - \$20.00. Registration starts March 15 and classes will be filled on a first come basis. Lessons will run for four weeks starting March 29th.

## SCUBA DIVING

The JSC Scuba Diving Club will offer a certified course in the use of scuba beginning the last of March. The course will include classroom lectures and supervised practical experience in the use of Scuba. Enrollment will be limited to twenty-five persons.

Upon successfully completing the course, participants will be certified by the National Association of Underwater Instructors.

Members of the Lunarfin receive reduced rates for the rental of club equipment and special boat rates for gulf diving. Persons interested in the course or other club activities should call Fred Toole at 2731 or Bill Moran at 2415.

## ROUNDUP



DO-SI-DO AND WHATEVER - Everyone grabbed their partners for Cotton-Eyed Joe and other dirt-kickin' music during the second annual EAA Country-Western Dance February 21 at the Gilruth Recreation Center. Music with Levis was played by the Music Masters from Bryan.

## 80 Tee Off In El Dorado Golf Match

By Milt Heflin

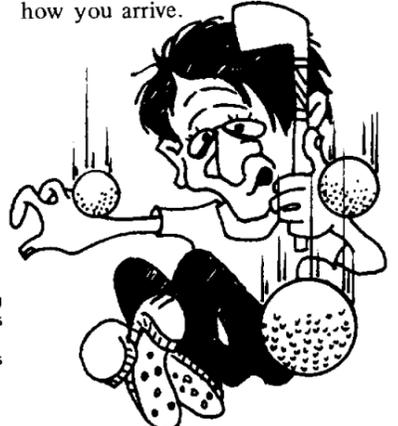
The Scramble at El Dorado had a good turnout - only 12 of our 92 members missed the event.

We got off to a rather bouncy start as our leader (JSCGA President) ordered up a bucket of balls

at the machine without the bucket in place. He went away mumbling something about the thing not working like a Coke machine.

I watched one of my group run through a four-way stop near the course then stood out of the way in the parking lot while another one of my fearless team mates drove his car around the parking lot until it came to a stop because he lost his brakes some where on the Gulf Freeway. And I wonder why I am never on a winning team in a fun tournament.

I understand Jim Briley had just proudly placed the closest to the hole flag on the #15 for his shot and then watched Tom Matuszewski cleverly run his ball through the trap to get even closer. Remember Jim, it's not how you drive, it's how you arrive.



And what about that double bogey scored by Don Odom, Fred Wrinkle, Jerry Stein, and Dale Pettit on the #17? I understand they gamboled in the woods and sweated our 28 strokes on the hole while the group behind them never got close enough to get hurt.

That same hole also gave up two eagles - Rich Stolarski, Woody Tramel, Al McIntyre, and Don Jacobs and the group of Doug Skinner, Bob Gordon, Lou Vassel and Sam House.

The event was won by Stolarski's group with a 63. Bill Dusenbury, Pete Gist, Chris Mitros and Roy Keely placed 2nd with a 65, and 3rd went to the last group on the course, Ike Spiker, Dick Saler, Dave Dyer and Rich Castanias with a 66 (won the tie breaker with their birdie on #15).

Closest-to-the-holes: #3-Milt Heflin, #8-Ted Breezy, #10-Bob Heyer, #15-Tom Matuszewski

Scores: 63, 65, 66(3), 67(3), 68(3), 69(3), 70(2), 71(3), and 73

# Roundup Swap-Shop

Swap Shop advertising is open to JSC federal and on-site contractor employees. Goods or services must be offered as advertised, without regard to race, religion, sex or national origin. Non-commercial personal ads should be 20 words or less, and include home telephone number. Typed or scribbled ad copy must be received by AP3/Roundup by Thursday of the week prior to publication.

## VEHICLES

64 Chevy Impala, air, radio, elec windows, auto, 327 hi-perf eng, Feb 76 insp, body fair, trnsprt with a zip. Castle, 483-4405.

72 Opel, air, auto, 4-D, orig owner, 42,000 miles, two dmgd fndrs, xint economic student or work trnsprt, \$350 firm. 488-7285 wknds.

73 Honda CL-350, good cond, approx 8000 miles, \$650 or reasbl offer. Johnston, 481-1951.

Two girl's bikes, old but svclbl, \$10 each, 944-8205 after 4:30.

75 Honda CB-750-4, sissybar, lugrack, xint cond, \$1695. 358-2004 or 944-0745 after 7.

71 Suzuki 350, perf cond, many xtras. 333-4641.

65 Galaxie 4-dr, air, pwr, runs well, good tires. 334-3240.

68 Plym Satellite, good gas mileage, 3 new tires, auto, air, \$685. Seal, 946-1070.

76 Cordoba, maroon, white vinyl top, maroon int, air, pwr, stereo, low miles, \$4990. 686-1923.

72 Honda 350, 7400 miles, good cond, \$650. 471-4080 after 5.

68 Chevy Biscayne, 307, auto, air, recent ovrl, xint cond, \$600. Harvey, 581-2341.

71 Buick Centurion 4-dr hrdtp, AM/FM radio, pwr. Larson, 482-3920 after 4:30.

69 Impala 4-dr hrdtp, 327, air, auto, radio, pwr, steelbelts, good cond, \$1000. Beatty, 482-7938 after 4.

73 Honda SL-350K2 dirt/street bike, \$550. Bullock, 488-6095.

73 Honda CB-175, xint cond, low mileage, cust paint job, \$375. Lizza, 554-7149.

67 VW Bug, FM radio, very good cond, \$650. 333-3071.

26-in boy's Raleigh 3-spd bike, \$40. 334-2180.

Sears 5-hp minibike, \$35. 474-4386.

60 T-Bird, new tires, muffler, ovrlhd eng/trans, \$499. 474-4386.

64 Volkswagen, runs well, \$275. 333-3426 after 6.

72 Pontiac Granville hrdtp 2-dr, auto, air, good cond, \$1800 cash. 333-3897.

71 Chevy Belaire 4-dr, 350 V8 2-bbl, air, pwr, 60K miles, no rust; new shocks, plugs, ign leads, dist cap, recent trans ovrl, perf int, \$1145. Clay, 481-1507 after 4:30.

73 Pontiac LeMans 2-dr, air, pwr, tiltsteer, AM/FM, 32,500 act miles, \$2800. 488-0093.

68 Mercury Colony Park sta wgn, pwr, auto, air, clean, runs well, \$695. McCaulley, 471-3298.

## BOATS

Partnership in 25-ft Bertram w/twin outdrives/engines, ideal for scuba and offshore fishing. Stubblefield, 334-1370.

16-ft Glasstron semi-V, 75-hp Evinrude, big-wheel galv tilt trlr, \$995; 20-ft Sportsman shrimp net w/boards, \$100. 479-3872.

72 Venture 22, wrkng sails, head, dinette, sleeps 5, anchor, 6-hp Sea Gull, trlr, many xtras, \$3500. Bullock, 488-6095.

74 Bayliner I/O 22-ft Skagit Camper, under 30 hrs, 188 Mercruiser, stove, ref, toilet, sink, full canvas, \$7800. Camp, 938-7302.

15-ft Larson, 55-hp Johnson OB, xint cond, barely used, good fish or ski boat, bigwheel trlr, \$2300 or best offer. Allgeier, 474-3961.

## PROPERTY & RENTALS

2-bdr apt in by-the-sea condominium at Galveston West Beach, air cond, carpets, full kitch, color TV, weekly rent. Clements, 474-2622.

2.5 acres of FM518 toward Friendswood. Mary, 474-4247.

2-acre lot in Friendswood ElDorado subdiv, \$8000. Zupp, 482-7156.

Lake Livingston wooded waterview choice lot at Cape Royale, enjoy fishing, hunting, tennis, golf etc, ideal homesite or investment. 488-4487.

3-2-1 in Lake Livingston Cape Royale, attractively furn, wooded, waterview, rent wkly or mnthly, reserve early. 488-4487.

## HOUSEHOLD ARTICLES

Beautiful sofa, makes bed, done in imprtd fabric, off-white (Henredon), sacrifice \$350. 488-5564.

Twin solid-maple spindle bed frame, \$35. 488-1366.

Gullbranson spinet organ, \$450. Richeson, 482-1064.

Used green nylon carpet, approx 20 sq yds, make offer, Poindexter, 474-2203.

Free: one giant Century Plant at 1833 El Mar Lane, bring shovel. 474-2203.

Hvy-duty all-cycle Kenmore washer and dryer, washer 3 yrs, dryer 1 yr, both \$350. Brownlee, 944-2390.

6-ft wide double sliding glass door, comple w/frame, \$25. Jenkins, 946-0819.

## PETS

AKC-reg Wire-Haired Fox Terrier, 3 yrs old male, papers, \$65. 488-0093.

AKC-reg male Cocker Spaniel puppies, buff, Ch bloodlines, pedigree incl, \$100-\$125. 482-7858.

Five healthy gerbils, 10-gal tank plus accessories, \$5. 333-2717 evgs.

Basset Hound puppies ready for Easter gift for loved one any age, AKC reg, Ch bloodline. Maley, 483-6457.

Free male English Setter, 7 mos, good with children, good watchdog, too big for my yard. Erickson, 649-0396.

6-mos-old male Border Collie/Lab, good hunting potential, shots, free. 474-2988 after 5.

Fawn/white Boxer puppies, top quality show prospects or pets. Bailey, 337-2855.

## WANTED

Pregnant person needs female bowling replacement in NASA mixed leagues Tues nites, 6 pm. 488-1262.

Used 12-15-cu ft upright freezer less than 5 yrs old. Black, 482-1635.

## MISCELLANEOUS

Britannica's 72-volume Great Books (not encylopedia), xint cond, new \$500, sell \$250. Symes, 554-6102 LgCty.

73 Mercury 7.5-hp OB motor, like new, \$75. Seal, 946-1070.

Time-control Massage-A-Belt, lo and hi settings, little used, \$50. Seal, 946-1070.

Used Wilson 1200s men's golfclubs D-Zero: 4 woods, 2 thru PW irons, bought thru pro shop. 471-2419.

Table soccer game (Foolsball), \$20. Thompson, 332-2229.

Black & Decker elec edger w/50-ft cord, good cond, 2 yrs old, \$30. LaVerne, 738-2766 after 6:30.

Baby bed w/mattress, \$35; wooden hi-chair, \$15; 2 strollers, \$8 and \$5; other misc baby furn, all xint cond. LaVerne, 738-2766 after 6:30.

Giant 7x7x5-ft children's backyrd monkeygym, low at \$25 'cause it needs painting, structurally sound; also child's sandbox w/seats, sunshade frame, \$15. Allgeier, 474-3961.

7x7-ft 3-man super-light nylon tent w/main fly, like new. 488-8706 after 5.

3 trued 14-in Chevy Malibu wheels, \$5 each. 946-0656.

Drapes and rods for 52x72 and 84x124-in windows, beauty pleat, off white, both \$50. 333-2395.

1/2-hp 120-v 3350-rpm elec motor, \$30. 333-2395.

Membership in Bay Area Racquet Club, save. 333-2395.

Kenmore elec clothes dryer, \$40. McCreary, 946-5285.

Prism viewfinder for Mamiyaflex C220 or C330, \$85; grip holder, \$9. McCreary, 946-5285.



FELLOWSHIP POW-WOW - Representatives of NASA and the University of Oklahoma discuss the NASA Aerospace Fellowship Program in which three American Indian OU engineering students will intern at JSC starting in June. Meeting at OU's main campus in Norman are OU Engineering College dean William R. Upthegrove, JSC engineer Jerry Elliott, OU President Paul F. Sharp, Jurgen Pohley of NASA Headquarters Office of University Affairs, and OU College of Engineering director of Indian Programs George Thomas. (OU photo)



# Space-gained Know-how brought to Earth in NASA's Tech House

An innovative "house of the future," featuring technology developed from aerospace research, is being built by NASA's Langley Research Center, Hampton, Va.

Called the Tech House, the contemporary-style home will provide a practical research demonstration of how an average family can cut its fuel consumption by as much as two-thirds and its water consumption by one-half through the use of advanced technology.

Officials believe the Tech House concept and design may influence near-term developments in home construction by demonstrating how innovative energy and water management systems can be integrated with building designs and materials.

Tech House is a project of the NASA Technology Utilization Program. Construction of the home started late in January and is expected to be completed by July 1. The house will be open to the public for the remainder of the Bicentennial Year.

Dr. Ross L. Goble, chief of Langley's Research Facilities Engineering Division, is directing the Tech House Project. He believes results from the project will be extremely helpful to home owners and home builders throughout the country.

"The house will demonstrate the latest NASA technology and commercial building techniques," Goble says, "emphasizing how much space-age technology has in definite domestic applications."

All equipment and features incorporated into the house are already available to the public, or are estimated to be within five years. Maximum use has been made of energy saving ideas and equipment throughout the house.

A family selected by NASA will live in the house for at least one year, beginning in early 1977. A systems engineer will monitor all systems and record day-to-day savings contributed by the systems as they are used in the normal life of the family. The house will again be opened to the public after all research data are collected.

The house is of contemporary, one-story design. It will feature a large living room with fireplace, dining area, kitchen, two baths, laundry, two-car garage and outdoor living area. Total enclosed living space will be approximately 1,600 square feet.

Design of the house was selected from engineering studies made by the architectural firms of Forrest Coile and Associates, Newport News, Va., and Charles W. Moore Associates of Connecticut.

Dr. Goble believes the house can be commercially built within five years for about \$40,000 to \$50,000, depending on customer preference and construction location. The extra initial costs of the Tech House could be absorbed in eight years, and the house would save about \$20,000 in a 20-Year period - the average length of a home mortgage - according to Goble.

Special features have been incorporated into the design of the house only if they are "cost effective," meaning if the initial cost of a particular feature pays for itself in energy savings, or if equipment has specific benefits such as providing personal safety or fire safety.

All systems and equipment must meet these criteria. The cheapest system or appliance will not necessarily be selected if it is not as energy-efficient as a more expensive system.

Major features of the house include:

Solar collectors, combined with night radiators and heat pump. The combination of solar heat sources with heat pumps provides one of the most cost effective heating and cooling systems now available.

Approximately 320 square feet of flat-plate, fluid-type solar collectors, located on the roof of the house, will supply more of the requirements for space heating and domestic hot water. Excess heat will be stored in a water storage system for use at night and on cloudy days. Additional heat sources are controlled by venting large appliances (such as the refrigerator, freezer and wall oven) inside in cold weather outside during hot weather. The system could be cost effective by 1981.

Waste water partial reclamation. This system should cut water consumption in half when combined with other savings methods. Waste water from sinks, bathtub and laundry equipment will be collected, chlorinated, filtered and recycled for use as toilet flush water. The system should also reduce requirements for the community sewage system. (Studies already completed

at Langley have proven that the waste water system's advantages outweigh such disadvantages as high initial cost, space requirements and maintenance costs.)

Advanced control systems. These can cause substantial energy savings by their extremely accurate control of heating and cooling. Such systems are already becoming cost effective because of integrated circuitry and mass production.

Plastic foam insulation. Urea tri-polymer foams and low-flame-spread styrofoam will provide superior fire-resistant insulation. These products will be used where they are safe and cost effective.

Flat conductor electrical cable system. Flat conductor electrical cable has greater current carrying capacity than equivalent cross-sectional amounts of solid round wire because of cooler operation. Flat cable, used for low-voltage switching circuits, will also substantially reduce copper requirements and installation costs.

Solid-state appliances. These are more energy efficient than other appliances and will be used wherever possible throughout the house. All of them are now commercially available.

Heat pipe systems. These space-age developments, excellent conductors of heat, will be used to recapture waste heat from the waste water storage tank and, possibly from the fireplace flue. The cost effectiveness of this kind of

system will be studied during the project.

Fire and security systems. Ionization smoke detectors and intrusion detectors will be installed. Most fire related deaths are caused by smoke inhalation rather than by burns. The system will operate independently from the house electrical system, but it will use house current to recharge its batteries.

The Tech House is physically situated to take advantage of site conditions at the Langley Center. The house will face east, but its solar collectors will face south for best exposure to the sun. Extra window glass, also facing south, will be evaluated and compared with conventional windows.

The Tech House Project is the result of a recommendation made last year by Edward Z. Gray, NASA Assistant Administrator for Industry Affairs and Technology Utilization, and Edgar M. Cortright, former Langley Director. They proposed that NASA should consider direct application of its technology in the design and construction of domestic residences. At the same time they recommend that energy saving ideas be incorporated where possible.

Information on energy and resources conservation in the housing industry was collected by Langley engineers from industrial trade and other organizations involved in the design or manufacture of energy

conserving components and systems. Reports from testing organizations, and a NASA design team's own experience, were used to evaluate components selected for the Tech House.

Dr. Cecil Kirby of Langley, Project Manager for the Tech House, listed some of the organizations that contributed to the project. They include NASA field centers, the National Association of Home Builders, the Department of Housing and Urban Development, National Bureau of Standards and Technological Economics, Inc.

Old Dominion University, Norfolk, Va., supplied housing-related engineering research conducted by universities, and Hampton Institute of Hampton, Va., experimented with floor plan arrangements.

One study used by Langley researchers in their calculations indicates that a contemporary house occupied by a family of four uses the equivalent of about 46,000 kilowatt hours of energy a year for central heating and air conditioning, water heating, lights, kitchen appliances, television, furnace fan and other equipment.

Dr. Goble estimates that the NASA Tech House will use only about 15,000 kilowatt hours of energy a year. This two-thirds saving will not only conserve valuable energy resources, but will pay for the initial investment in a relatively short time.

